

## Technical and economic feasibility of electricity generation from wood reforestation in Amazon

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Most of electricity generation in Brazil is from hydroelectric origin for the interlinked system. However there is the non solved question of the energy supply to the isolated communities in Amazon. The energy supply in these regions is based exclusively on diesel motors, old and inefficient, corresponding to large-scale pollutant emissions, including carbon emissions.

On the other hand there is the problem of the extremely important question of the high consumption of diesel oil in the country. Because of that, Brazil imports today pure diesel oil, besides regular oil imports; six billion liters of diesel oil were imported in 1998 corresponding to 630 million dollars, according to the National Petroleum Agency (ANP) [1]. Besides the expenditure with oil imports, the country expends 200 million dollars per year (in average) in subsidies for diesel oil generation in Amazon, to keep accessible to the communities the electricity generated in those motors [2]. This is the so-called Fuel Consumption Account (Conta Consumo de Combustíveis, in Portuguese, CCC).

On the other hand, there are the huge deforested areas in Amazon, which could be partially used for wood plantations aiming energy generation. Legal Brazilian Amazon is 5.035.958,9 km<sup>2</sup>, and the degraded land is estimated in 18,161% (914.580,49 km<sup>2</sup>) [3]. Therefore, the proposed possibility could not only collaborate to the energy supply in the region, but also to the reforestation of Amazon and the reduction of pollutant emissions. It can also allowing the future exchange of carbon credits in the context of the Kyoto Protocol (Clean Development Mechanism). The economic feasibility of biomass projects in Amazon is now quite attractive due to the new regulation introduced by ANEEL, the National Agency for Electric Energy, extending the CCC to the renewable energy generated in Amazon. This will be possible until the year 2013 and is an extremely high subsidy (around US\$ 100 per MWh generated).

In this context, this paper presents the results from the study case realized by CENBIO and Winrock Foundation. This study evaluates under technical and economic aspects the implementation of two thermoelectric power plants in Amazon (4 MW and 20 MW, to firm energy from existing small dams), using biomass from wood plantations in degraded areas. The economic analysis is divided into two possibilities:

- including the existing subsidy (CCC) for the energy generated;
- Including the carbon credits due to the carbon avoided by the replacement of diesel oil and assuming the electricity will be sold by the Normative Value, NV (a ceiling price established by ANEEL according to the primary source of energy).

It must be considered that this NV is not a minimum price, it is higher limit for the incorporation of this price (paid by the utility when purchasing the electricity) in the final price for the consumers [3].

After the development of the technical analysis (conventional steam systems), including the evaluation of the wood plantation area needed for the biomass production, the economic analysis was performed considering the above assumptions. Financial conditions were assumed equal to 8 years, 15% p.y. and biomass costs were taken equal to US\$2,00/GJ or US\$ 25,00/t [4].

Final results are quite positive both for the 4MW and the 20 MW plants, when considering the existing CCC subsidies (more than 30% of internal rate of return, in most cases). Sensibility analysis shows less important results when considering carbon credits. However it must be considered that the current regulation will end in 2013, so future projects will not be able to receive it and its economic results will be not so positive.

This means that new policies still must be discussed for the electricity generation in isolated areas, especially in Amazon, to make feasible new renewable energy projects.

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